

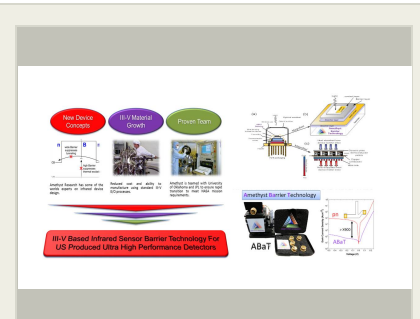
Detectors with Improved Near-to-Mid IR Performance and Reduced Cooling Requirements, Phase II

Completed Technology Project (2014 - 2016)



Project Introduction

This program will develop an ultra-high performance infrared detector manufacturing technology with improved performance and cost effectiveness, and reduced cooling requirements when compared to the best commercially available HgCdTe and InGaAs detectors. This will be accomplished using a two-pronged approach addressing both device design and materials. First, the conventional pn photodiode device is replaced with a new device structure, the nBn detector, which inherently suppresses performance-limiting dark currents, such as those produced by surface leakage. Second, highly manufacturable III-V materials are used, which are further enhanced with Amethyst's proprietary UV hydrogenation defect mitigation process. The result is a low cost, high performance detectors operating in the 2 – 5 micron wavelength region. There is a pressing need for ultra-high sensitivity detectors operating in this region for the detection of trace gases and chemicals. In Phase I Amethyst produced a 2.8 micron cutoff detector. The program met all objectives, demonstrating considerable improvements in performance over conventional pn diodes using the nBn and hydrogenation approach. In Phase II, Amethyst will design, fabricate and test high performance detectors individually optimized with cutoff wavelengths throughout 2–5 micron wavelength range. These detectors will have improved detectivity, and significantly reduced cooling requirements compared to currently available commercial detectors. In addition, Amethyst will deliver a thermoelectrically cooled 3.3 micron wavelength cutoff detector to JPL's Microdevices Laboratory for comparative testing and to assist in development of methane detector systems. The overall objective of the Phase II is to establish performance metrics, manufacturing process, characterize and life test single element devices. These efforts will help establish a US based manufacturing source of these ultra-high performance detectors.



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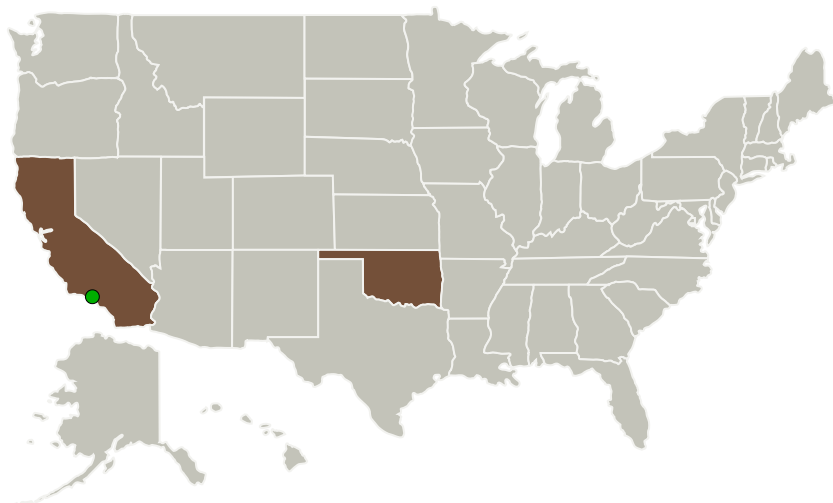
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Amethyst Research Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Ardmore, Oklahoma
● Jet Propulsion Laboratory (JPL)	Supporting Organization	NASA Center	Pasadena, California
University of Oklahoma-Norman Campus	Supporting Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH)	Norman, Oklahoma

Primary U.S. Work Locations

California	Oklahoma
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Amethyst Research Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

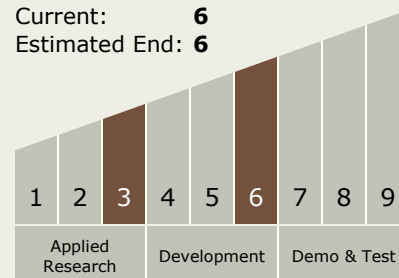
Carlos Torrez

Principal Investigator:

Terry D Golding

Technology Maturity (TRL)

Start: 3
Current: 6
Estimated End: 6



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Project Transitions



September 2014: Project Start



September 2016: Closed out

Closeout Summary: Detectors with Improved Near-to-Mid IR Performance and Reduced Cooling Requirements, Phase II Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/137495>)

Images



Briefing Chart Image

Detectors with Improved Near-to-Mid IR Performance and Reduced Cooling Requirements, Phase II
(<https://techport.nasa.gov/image/135314>)



Final Summary Chart Image

Detectors with Improved Near-to-Mid IR Performance and Reduced Cooling Requirements, Phase II Project Image
(<https://techport.nasa.gov/image/129275>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.1 Remote Sensing Instruments/Sensors
 - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System